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# SCIENCE:

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WE CALLED ATTENTION last week to the condition of affairs in the New York City Board of Education, and chronicled the triumph of political chicanery over public interest in the organization of the board for the coming year. Inasmuch as this situation in New York is of the greatest importance to educational interests all over the land, we shall revert to it from time to time, and endeavor to aid in forming an intelligent and conscientious public opinion which shall eventually displace the politicians and the politics that are now controlling the schools of the metropolitan city. The next contest will be over the report of the special committee on reform in the schools, the first instalment of which is now before the board, for action at its next meeting. The report is signed by Commissioners Webb, Cole, Sprague, O'Brien, Agnew, Dodge, Galloway, and Schmitt. It limits its consideration to a single point, and that perhaps the fundamental abuse of the New York City system; namely, the examinations of the children, as made by the city superintendent and his assistants, for the purpose of marking and grading the teachers and principals in the respective classes and schools. The committee believe—and we cordially indorse that belief—that many of the existing evils in the schools are the outgrowth and natural sequence of the methods now employed in a vain attempt to ascertain the true character of classroom work. The vicious system which is now in vogue has not (happily) the

sanction of any statute; but it has been built up by the present city superintendent and his predecessors, on the meagre provisions of a single by-law of the Board of Education itself.

This is the committee's account of the system: "The city superintendent or his assistants examine, orally and in writing, the children of every class in every school at least once a year. When the examination is to be made, a notice, varying in time from one to six days, is sent to the principal and teachers. The average time that the examiners spend with each class does not exceed half an hour. The main object of the examination of the pupils is to grade and mark the teachers, and to determine with what degree of success the classroom work is carried on. Marks are given by the examiners to the teachers on each subject; but the teachers are not informed what marks are awarded, nor is any provision made by which such information may be conveyed to them. The general results are reported to the trustees of the respective wards in which the teachers are employed; but as to how such results are reached, or in what particular subject a class may have failed, the record is silent. The teachers know that these marks (if they receive any attention) will form the basis upon which promotion, or worthiness for promotion, is to be determined. They know that in case of illness, when it may be necessary to come before the board, if the marks are below a certain standard, the salary expected may be seriously diminished; and that, in case two marks of 'fair' are awarded in succession, a summons will be received to appear before a committee of the board and answer to a charge of inefficiency as a teacher. At times, to the young, nervous, or inefficient teacher, the examination is a positive bugbear, and the examiner a natural enemy; and this estimate is speedily detected and shared in by the pupils. In such a class the examiner is not looked to for help, suggestion, or instruction; but he is regarded as one from whom all faults and weaknesses must be diligently concealed, and before whom the children are to make as brilliant a show as possible. His sole purpose is to assign a mark for each study, and that mark is to go down on the official record, to aid or mar the teacher's future advancement in the system."

This is the barbarous practice by which the executive officers control the schools and intimidate the teachers. Its mere statement is sufficient indictment. What are you going to do about it? say its beneficiaries. The committee is ready with an answer. After adequate examination, divide the teachers once and for all into two grades,—maximum and standard. All teachers who have been at least five years in the system, and who satisfy the principals with whom they have served, and the city superintendent (or, if they fail to agree, the committee of the Board of Education on teachers), are to be classed as maximum grade, and relieved of future examinations by the superintendent or his assistants, unless the principal reports that such a teacher is falling off and should be subjected to inspection. All other teachers shall be classed as standard grade, and shall receive not only visits of inspection, but help, from the assistant superintendents, in order to aid them in improving their work and in passing to the higher classification. The committee elaborates this principle, and reports the necessary amendments to the by-laws of the board, to place it in operation. The recommendations should be adopted, although it is reported that the "ring" will oppose them bitterly. We shall await the vote with interest.

## THE VALUE OF MERCURIC CHLORIDE AS A DISINFECTANT.

IN *Science*, xii. p. 185, we quoted at considerable length from an article by Dr. W. B. Hills of Cambridge, Mass., which first appeared in the *Boston Medical and Surgical Journal*, in which the author of the article criticised in severe terms the recommendations of the committee on disinfectants, of the American Public Health Association, with reference to the use of mercuric chloride as a

disinfectant. In commenting on this article of Dr. Hills's, we said that Dr. Hills's criticisms dealt, not with generalities, but with particular errors which he claimed the committee had made, and that his criticisms put the committee on its defence.

In an exceedingly able article published in the *Boston Medical and Surgical Journal* of Jan. 3, 1889, Professor V. C. Vaughan, of the University of Michigan, and a member of the committee on disinfectants, meets the criticisms of Dr. Hills completely, and places the report of the committee on more substantial ground than ever. This reply of Professor Vaughan's we have deemed of sufficient value to give in full.

The report of the committee of the American Public Health Association on disinfectants, together with the experimental investigation of others, has given great prominence to the employment of mercuric chloride as a germicide. Recently (*Boston Medical and Surgical Journal*, Aug. 25, 1888) Dr. William B. Hills of Cambridge, Mass., has criticised the above-mentioned report so far as it recommends mercuric chloride. As this is a matter of great practical importance, I propose in this paper to notice the points raised in this criticism. Dr. Hills does not seem to have made any biological or chemical tests himself, but finds his opinion upon what he deems to be well-established facts. The critic uses severe language with reference to the committee, and asserts that "it is not creditable" that the committee should have made the recommendations referred to upon the experimental evidence presented.

In the first place, Dr. Hills states that corrosive sublimate is rendered insoluble when brought in contact with organic matter. He says: "It is, however, a well-known chemical fact that the corrosive sublimate is destroyed, or at least undergoes chemical changes, when brought into contact with organic matter. It is immediately converted by albumen to the insoluble albuminate of mercury. For this reason, albumen is recognized as the most efficient antidote in cases of poisoning by corrosive sublimate."

Now, let us inquire into the well-known chemical fact referred to by Dr. Hills. I endeavored to show in the report, which Dr. Hills criticises, that the albuminate of mercury is soluble in solutions containing organic matter, and that it does diffuse through such solutions; but, as Dr. Hills places his opinion against my experience, we will see what others say upon this point. Merck (*Merck's Bulletin*, August, 1888) of Darmstadt says that the albuminate of mercury, which he manufactures according to the formula of Schneider (*Pharm. Centralblatt*, 1888), is readily soluble in blood-serum, meat-broth, sodium chloride, etc. Every physician knows that the albuminate of mercury is used hypodermically on account of its ready solubility and non-irritating properties. For the preparation of this compound either egg-albumen, blood-serum, or peptone is used. Merck uses egg-albumen, while Filehne (CLOETTA'S *Lehrbuch der Arzneimittellehre*, 1887, S. 134) recommends the following formula: "15 grams of dry peptones, 10 grams of bichloride of mercury, 15 grams of ammonia chloride, and enough water and glycerine so that each cubic centimetre of the solution shall contain from two to four milligrams of mercuric chloride." Other formulæ are given by other authors. In one place Dr. Hills admits that the albuminate of mercury is "slightly soluble," but he says "the amount redissolved is very small." Filehne's solution contains more than two and a half drams of the bichloride. This amount would hardly be called "very small." When Dr. Hills says that albumen is recognized as the most efficient antidote in cases of poisoning by corrosive sublimate on account of the insolubility of the albuminate of mercury, he teaches a doctrine which, I must admit, is wholly new to me. Mercuric bichloride owes its corrosive properties to the avidity with which it combines with proteids. In cases of poisoning by this salt, we give the albumen in order to supply a proteid with which the poison can combine without injury to the walls of the stomach, and then we hasten to give an emetic. What would be the result if we should leave the albuminate of mercury in the stomach? If this compound is so insoluble, why do we give the emetic? The idea that the albuminate of mercury would not be readily absorbed by the stomach, is, to use some of Dr. Hills's vigorous English, "so absurd that it would not deserve serious notice were it not for the fact" that it has been suggested by one so eminent in the profession. If mercury forms an inert compound with albumen and other proteids, how is it that

we get constitutional effects by the administration of the compounds of this base in the treatment of disease? Are the contents of the stomach and intestines always free from proteids when the medicine is administered? The truth is, that the albuminate of mercury is insoluble in water, but is freely soluble in excess of albumen, in blood-serum, in meat-broth, in solution containing sodium chloride, etc. Indeed, all the mercury given medicinally is said by leading therapeutists and physiological chemists to be converted into the albuminate before it is absorbed. Filehne says concerning the absorption of mercury: "The salts of mercury soluble in water form first with albumen compounds, which, partly in excess of albumen, partly from the action of other substances, as sodium chloride, hydrochloric acid, etc., are soluble, so that the passage of these compounds into the blood as soluble albuminates is undoubted. The compounds insoluble in water are, by the action of sodium chloride and hydrochloric acid, converted into the sublimate, and this in turn into the albuminate." Nothnagel and Rossbach (*Handbuch der Arzneimittellehre*, sechste Auflage, S. 194) say that while the albuminate of mercury is insoluble in water, it is freely soluble in excess of albumen and in sodium chloride.

Dr. Hills again says: "Sternberg, in the *Medical Record* for Aug. 1, 1885, affirms positively that the albuminate (of mercury) is a potent germicide, but gives no facts in support of this statement. Klein's experiments, however, suggest that its germicide power is very slight at the most. Admitting, however, that it has such power, the amount redissolved is very small, and this is likely to be converted at once to the inert sulphide by the sulphuretted hydrogen present."

I have italicized the assertion to which I desire to give immediate attention. Here Dr. Hills is again wrong. Sulphuretted hydrogen does not decompose the albuminate of mercury. Every toxicologist knows this, and destroys the organic matter before he attempts to precipitate mercury from solutions containing proteids. In the report of the committee, where I show that the albuminate of mercury is soluble, I state that the organic matter was destroyed by potassium chlorate and hydrochloric acid, after which the mercury was precipitated with sulphuretted hydrogen. Nothnagel and Rossbach (*loco citato*) say that "from the albuminate of mercury one cannot precipitate the metal with sulphuretted hydrogen until the organic matter has been destroyed." If sulphuretted hydrogen precipitate mercury from proteid solutions, the mercury so precipitated is not combined with albumen, and the occurrence of such a precipitation shows that the mercury exists in excess above that taken up in the formation of the albuminate. The albuminate of mercury is not easily decomposed.

Again: Dr. Hills thinks that the alkalies formed in decomposing matter would precipitate the mercury. Nothnagel and Rossbach (*loco citato*) say that "if common salt be added to an alkaline solution of albumen, mercuric chloride will then fail to produce any precipitate." No one will question the existence of common salt in privy-vaults.

It is true that Klein's experiments suggest that the germicide power of mercuric albuminate is very slight at most. Indeed, Klein asserts (or rather did assert) that a one-per-cent solution of mercuric chloride is no more a germicide than is vinegar. Certainly no one will now champion this statement, although vinegar is not worthless as a germicide. Koch found that the spores of the anthrax bacillus will not germinate in a proteid solution if there be present one part of corrosive sublimate in three hundred thousand. And yet Dr. Hills, without having made an experiment, condemns the committee for recommending a solution of corrosive sublimate, one to five hundred, for the disinfection of the liquid discharges of cholera, typhoid-fever, etc.

Dr. Hills finds very strong language of condemnation for the report of the committee in recommending that the amount of bichloride found necessary to sterilize broken-down beef-tea be multiplied by two, and used for the disinfection of the liquid discharges from the bowels of patients with cholera, typhoid-fever, advanced tuberculosis, septic diarrhoea, etc. As he bases his condemnation upon the incompatibility (?) of mercuric chloride with albumen, he must suppose that these stools contain a large amount of soluble proteids. In this he is again wrong: such discharges do not contain large amounts of albumen or other soluble proteids.

Simon (BECQUEREL and RODIER'S *Pathological Chemistry*, p. 459) obtained the following results from the analysis of the faecal matters in cholera :—

Water .....	98.00
Solid matters.....	20.00
Fat .....	0.08
Extractive matter.....	4.80
Albumen and mucus.....	0.52
Chloride of sodium, lactate and acetate of sodium, and alkaline phosphates.....	13.40
Phosphate of lime and magnesia .....	0.60

The blood contains, according to Hammerston, from 2.677 per cent (horse) to 4.436 per cent (rabbit) of serum albumen; and yet, according to Von Ermengen, mercuric chloride in solution of 1:800 and 1:1,000 sterilizes blood. With these figures before us, can we say that "it is not creditable to a committee of the leading sanitary association of this country" to recommend a solution of mercuric chloride 1:500 for the disinfection of cholera stools?

Practically we know that mercuric chloride does efficiently disinfect substances containing a hundred times as much proteid as cholera stools contain. This is done many times every day in bacteriological laboratories. Gelatine plates and tubes, agar tubes, and blood-serum tubes, laden with all the known germs, are disinfected with a solution of mercuric chloride 1:1,000. In Koch's laboratory this is the only disinfectant used, and there has been no evidence of its failure. Plates covered with colonies of the anthrax bacillus, the comma bacillus, etc., are immersed in the solution with the certainty that the sterilization will be complete. Old tube cultures are treated in the same way, and with the same result, whether they contain gelatine, agar, or blood-serum. Now, in the gelatine, one litre of beef-tea contains 100 grams of gelatine, 10 grams of peptone, and 5 grams of sodium chloride. We have seen that the albuminate of mercury is made with peptone as well as with albumen, and there is nearly twenty times as much peptone in this mixture as there is albumen in cholera stools, and nearly two hundred times as much gelatine besides. Certainly no one will question the large amount of albumen in blood-serum. Is it not strange, if the albuminate of mercury is so "inert," that the disinfection of these cultures should be so successful? Even the evacuations of infants with green diarrhoea, containing a large amount of undigested food, do not contain as much proteids as do gelatine cultures, as is shown by the following analysis of Golding Bird :—

Water.....	900.00
Biliverdin, alcoholic extracts, fat, cholesterine .....	24.50
Pryalin, watery extract, colored with biliverdin .....	11.25
Mucus, coagulated albumen, and hematin.....	56.00
Chloride of sodium, with traces of tribasic phosphate of soda.....	5.50
Tribasic phosphate of soda .....	1.75
Peroxide of iron.....	1.00

In the first report of the committee (1885) a solution of chloride of lime was given the first place for the disinfection of excreta in the sick-room, and a solution of mercuric chloride of the strength of 1:500 the second place. In the latest report (1888) carbolic acid has been given the second place, and mercuric chloride has not been recommended for this purpose. This change was made because the carbolic acid was believed to be sufficient, and not because the mercuric chloride was believed to be inefficient. In the light of the most recent experiments in this country and abroad, we believe that mercuric chloride, in the proportion named, would be effective in the disinfection of the liquid discharges of patients suffering from typhoid-fever or cholera, and that the recommendation made in our first report was justified by the experimental data then given, and not yet contradicted by any new evidence.

The committee called attention to the action of mercuric chloride on lead pipes in its first report, and this influenced it in substituting carbolic acid for mercuric chloride for disinfecting the excreta in the sick-room.

To return to our critic, the broad statement is made, that "an examination of the report of this committee fails, however, to bring to light the slightest particle of evidence upon which such a recommendation could have been based;" viz., the disinfection of excreta with mercuric chloride. Dr. Sternberg, chairman of the committee, made extended researches upon the germicide power of this agent several years before (1883) the committee was appointed, and to those experiments reference is made in the first report. It is for

this reason that extended experimental researches were not made with this agent in 1885. However, a number of experiments were made, and recorded in our report. These show that even the solid or semi-fluid faeces of a healthy person may be sterilized by the use of the solution recommended by the committee, provided that they are broken up so as to be fairly exposed to the action of the disinfecting agent. Moreover, the fact is recorded that a certain amount of the mercurial salt remained in solution at the end of twenty-four hours, as shown by a deposit of mercury on a copper wire (experiment of Sept. 8). Yet our critic, without recording a single experimental observation of his own, states that there is not the slightest particle of evidence upon which our recommendation could have been based.

One who has given no special attention to chemistry may be pardoned for not being acquainted with the chemical nature of the albuminate of mercury, but certainly any one who had read our report could not have made the sweeping assertion which we find in Dr. Hills's criticism.

#### FIFTH ANNUAL REPORT OF THE BUREAU OF ETHNOLOGY.

THE "Report of the Director of the Bureau of Ethnology for the Year 1883-84" has just been issued, bearing the date 1887. The long delay of this report, which is caused by the pressure of work in the Government Printing-Office, must be greatly regretted, as the interest of science demands that scientific publications of the character of those accompanying the report be known as early as possible. The knowledge that certain statements and opinions are about to be published always acts as a drawback upon the progress of the special field of science, as most workers will delay further investigations until these publications are issued. While a few branches of science may not be very adversely affected by these delays, such is not the case in the science of anthropology, in which the most energetic and unceasing field-work is absolutely necessary, as the relics of ancient times, as the natives and their customs, are vanishing with steadily increasing rapidity. Publications of such importance as the one under discussion always prove an incentive to increased activity. The opinions and suggestions expressed in the papers accompanying the report do not fail to influence the progress of investigations. For all these reasons a more rapid publication of the annual reports is very desirable.

Major Powell, in the first part of the report, gives a brief review of the work carried on by the bureau. The scope of the researches is constantly increasing. In the year 1883-84 the mound-explorations were continued. Messrs. Stevenson and Mindeleff carried on archaeological researches in the South-west, while Mr. Frank Cushing devoted himself to further studies on the Zuñi. Linguistic work was done among the Iroquois, in California, and among the Navajo. While the final results of the works of the bureau will be published as "Contributions to the Ethnology of the North American Indians," the papers accompanying the reports generally treat certain phenomena of Indian life or art in the form of monographs or reports on peoples on which no material for exhaustive reports is obtainable.

Of the latter class, we notice in the present volume Rev. Clay MacCauley's description of the Seminole Indians of Florida,—an interesting sketch of the life and state of this small tribe living in the most inaccessible portion of the southern half of the peninsula.

The elaborate paper on "The Cherokee Nation of Indians: A Narrative of their Official Relations with the Colonial and Federal Governments," by Charles C. Royce, is an historical document of the greatest importance, the history of this great confederacy in its conflicts with the white settlers encroaching upon their territory being traced fully and exhaustively. The paper is an illustration of a work of wide scope undertaken by the bureau,—an historical atlas of Indian affairs, showing, upon a series of State and territorial maps, the boundaries of the various tracts of country which have from time to time been acquired through the medium of treaty stipulations or act of Congress from the several Indian tribes resident within the present territory of the United States. Accompanying the atlas will be one or more volumes of historical text, wherein will be given with some detail a history of the official